VEC031POB

VECTOR MANUFACTURING, Ltd.

POWER ON BOARD™

400 WATT
POWER INVERTER

800 WATT
PEAK

OWNER'S MANUAL
& WARRANTY INFORMATION

THIS MANUAL CONTAINS IMPORTANT INFORMATION REGARDING SAFETY, OPERATION, MAINTENANCE AND STORAGE OF THIS PRODUCT. BEFORE USE, READ AND UNDERSTAND ALL CAUTIONS, WARNINGS, INSTRUCTIONS AND PRODUCT LABELS, PLUS YOUR VEHICLE'S BATTERY MANUFACTURER GUIDELINES. FAILURE TO DO SO COULD RESULT IN POSSIBLE INJURY OR PROPERTY DAMAGE.

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IMPORTANT INFORMATION

To ensure reliable service, your power inverter must be installed and used properly. Please read the installation and operating instructions thoroughly prior to installation and use. Pay particular attention to the WARNING and CAUTION statements in this manual. The CAUTION statements advise against certain conditions and practices that may result in damage to your inverter. The WARNING statements identify conditions or practices that may result in personal injury or loss of life.

KEEP THIS MANUAL FOR FUTURE REFERENCE.

WARNINGS:

- Do not connect to Household AC distribution wiring
- ***Remove appliance plug from outlet strips or turn off inverter before working on appliances.*** Multiple outlet power strips with switches and circuit breakers only interrupt power to the "hot" receptacle terminals. The "neutral" terminals remain powered with respect to the "ground" terminals.

CAUTIONS:

- Connect directly to power source with battery clip cables (included) when operating above 150 watts
- Do not use with positive ground electrical systems. (the majority of modern automobiles, RVs and trucks are negative ground) Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter and will void warranty
- This inverter will not operate high wattage appliances or equipment that produce heat, such as hair dryers, microwave ovens and toasters.
- Grounding the neutral terminals will cause the inverter to shut down
- Do not operate inverter near water
- Do not install in Engine Compartment – Install in a cool, well-ventillated area

CONTENTS

1. INTRODUCTION 4

2. How Your Vector Inverter Works 4,5
2.1 Principle of Operation 4,5
2.2 Vector Power-On-Board™ 400 Output Waveform 5

3. INSTALLATION 6

3.1 Power Source Requirements 6
3.2 Connection to Power Source 6-8
3.3 Connection to Load 8
3.4 Fuse Replacement 8
3.5 Placement of the Inverter 9

4. OPERATING TIPS 9,10

4.1 Rated Versus Actual Current Draw of Equipment 9,10
4.2 Battery Operating Time 10

5. PROTECTIVE FEATURES OF THE POWER-ON-BOARD™ 350 .. 10,11

6. COMMON PROBLEMS 11,12

7. TROUBLESHOOTING GUIDE 12,13

8. SPECIFICATIONS 13

WARRANTY 14,15

1. INTRODUCTION

Your new Vector® Power-On-Board™ 400 inverter is one in a series of the most advanced DC to AC inverters available today. With proper care and appropriate usage, it will give you years of dependable service in your car, truck, RV or boat.

The Power-On-Board™ 400 supplies 400 watts of continuous power, with a 800 watt peak, in the form of two household-type outlets that are ready to deliver 110 volt AC power whenever and wherever you need it! The heavy-duty inverter has enough power to run almost any household or electronic appliance, including color TVs (up to 25"), TV/VCR combinations, laptop computers, camcorders, cellular phone, camcorder, power tool chargers, lamps and many more. It also comes equipped with battery clips to handle higher amperage/load applications, such as;power tools, stereo amplifiers (up to 300 watt RMS), vacuums, etc. Added safety features include automatic shutdown and a low battery alarm to prevent damage to your battery.

This power inverter incorporates a new cooling technology that directly benefits our customers. The new design more efficiently cools the power transistors and thereby increases reliability and the life of the product.

Given proper care and appropriate use, your inverter is covered by a 120 day initial warranty. You may extend the warranty to two full years by paying a small fee. See the Warranty Information at the end of this manual.

2. HOW YOUR VECTOR INVERTER WORKS

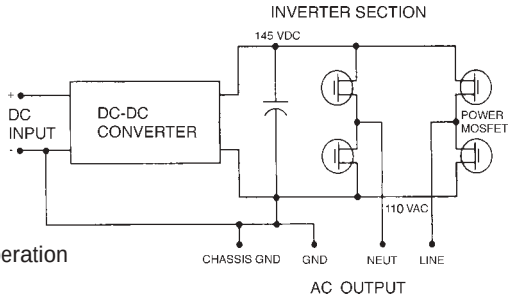
The inverter converts low voltage DC (direct current) from a battery or other power source to standard 110 volt AC (alternating current) household power.

2.1 PRINCIPLE OF OPERATION

The inverter converts power in two stages. The first stage is a DC-to-DC conversion process that raises the low voltage DC at the inverter input to 145 volts DC. The second stage is the actual inverter stage that converts the high voltage DC into 110 volts, 60 Hz AC.

The DC-to-DC converter stage uses modern high frequency power conversion techniques that have replaced the bulky transformers found in less technologically-advanced models. The inverter stage uses advanced power MOSFET transistors in a full bridge configuration. This ensures excellent overload capability and the ability to operate reactive loads like lamp ballasts and small induction motors.

FIGURE 1



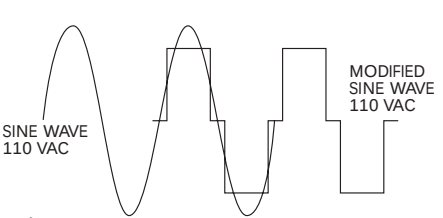
Principle of Operation

2.2 THE POWER-ON-BOARD™ 400 OUTPUT WAVEFORM

The AC output waveform of the Power-On-Board™ 400 is known as "modified sine wave". It is a waveform that has characteristics similar to the sine wave shape of utility power. This type of waveform is suitable for most AC loads, including linear and switching power supplies used in electronic equipment, transformers, and motors.

The modified sine wave produced by the Power-On-Board™ 400 inverter has an RMS (root mean square) voltage of 110 volts, which is the same as standard household power. Most AC voltmeters (both digital and analog) are sensitive to the average value of the waveform rather than the RMS value. They are calibrated for RMS voltage under the assumption that the waveform measured will be a pure sine wave. These meters will not read the RMS voltage of a modified sine wave correctly. They will read about 20 to 30 volts low when measuring the output of the inverter. For accurate measurement of the output voltage of this unit, use a true RMS reading voltmeter such as a Fluke 87, Fluke 8060A, Fluke 77/99 series, Beckman 4410, or Triplett 4200.

FIGURE 2:



Modified Sine Wave
and Sine Wave Comparison

3. INSTALLATION

3.1 POWER SOURCE REQUIREMENTS

The power source must provide between 11 and 14.5 volts DC and must be able to supply the necessary current to operate the load. The power source may be a battery or a well-regulated DC power supply. To obtain a rough estimate of the current (in amperes) the power source must deliver, simply divide the power consumption of the load (in watts AC) by 10.

Example: If a load is rated at 400 watts AC, the power source must be able to deliver:
400 ÷ 10 = 40 amperes

CAUTION: The Power-On-Board™ 400 must be connected only to batteries with a nominal output voltage of 12 volts. The unit will not operate from a 6 volt battery and will sustain permanent damage if connected to a 24 volt battery.

3.2 CONNECTION TO POWER SOURCE

The Power-On-Board™ 400 comes equipped with a cigarette lighter plug and battery clip cables for connection to the power source:

CAUTION: Do not use with positive ground electrical systems. (the majority of modern automobiles, RVs, and trucks are negative ground)

Connecting to Power Source Using Cigarette Lighter Plug:

The cigarette lighter plug is suitable for operating the inverter at power outputs up to 150 watts. The tip of the plug is positive and the side contact is negative. Connect the Power-On-Board 400 to the power source by inserting the cigarette lighter plug firmly into the cigarette lighter socket of a vehicle or other DC power source.

CAUTION: Connect directly to power source when operating above 150 Watts.

NOTE: Most automobile cigarette lighter circuits use fuses rated at 15 to 20 Amps or greater. To operate at full 400 watts output, either use the battery clip cable (supplied) or directly wire to the power source with user supplied wire and fuse.

CAUTION: Reverse polarity connection will result in a blown fuse and may cause permanent damage to the inverter.

Connecting to a Power Source Using Provided Cables:

If the inverter is to be used for extended periods at power levels above 150 watts, direct connection to the power source is recommended. Use the provided cables to connect the Power-On-Board™ 400 directly to the 12 volt power source using the following guidelines:

1. Check to be sure the Power-On-Board™ 400 power switch is turned off and that no flammable fumes are present.
2. Connect the black cable to the black post marked "(-)" on the back of the inverter. Connect the battery clip to the negative terminal of the battery.
3. Connect the red cable to the red post marked "(+)" on the back of the inverter. Connect the battery clip to the positive terminal of the battery.
4. Check to be sure that all connections between battery clips and terminals are secure.

Direct Hardwiring to Power Source:

Use #10 AWG wire if the inverter to power source connection is 10 feet or less. For longer cable lengths use #8 AWG wire. In either case, protect the positive (+) wire from shorts by installing a 40 Amp fuse or circuit breaker close to the DC power source (battery) terminal.

1. Check to be sure the inverter's power switch is turned off and that no flammable fumes are present.
2. Identify the positive (+) and negative (-) DC power source (battery) terminals.
3. Install a fuse holder or breaker close to the positive (+) terminal of the DC source (battery).
4. Connect a length of wire on one side of the fuse holder or circuit breaker. Connect the other end if the wire to the Positive (+) terminal of the inverter.
5. Connect a length of wire between he inverter's negative (-) terminal and the DC power source negative (-) terminal.
6. Connect a short length of wire to the other terminal of the fuse holder or circuit breaker. Mark it "POSITIVE" or "+".
7. Connect the free end of the fuse or breaker wire to the positive terminal of the DC power source (battery).

8. Insert a 40 Amp fuse in the fuse holder.
9. Test the inverter by turning it on and plugging in a 100 watt lamp or equipment.
10. If the inverter is not properly operating, then refer to the trouble-shooting sections of this manual.

CAUTION: Loose connectors may cause overheated wires and melted insulation. Check to make sure you have not reversed the polarity. Damage due to reversed polarity is not covered by our warranty.

3.3 CONNECTION TO LOAD

The Power-On-Board™ 400 is equipped with dual standard North American AC power receptacles. Plug the cord from the equipment you wish to operate into the AC receptacle(s). The green LED indicator will light to indicate that the unit is functioning. Make sure the combined load requirement of your equipment does not exceed 400 watts.

The Power-On-Board™ 400 is engineered to be connected directly to standard electrical and electronic equipment in the manner described above. Do not connect the Power Inverter to household or RV AC distribution wiring. Do not connect the Power Inverter to any AC load circuit in which the neutral conductor is connected to ground (earth) or to the negative of the DC (battery) source.

WARNING: DO NOT connect to AC distribution wiring

CAUTION: RECHARGEABLE APPLIANCES

Certain rechargeable devices are designed to be recharged by plugging them directly into an AC receptacle. These devices may damage the inverter. Do not use the inverter to recharge items that can be plugged directly into an AC receptacle.

This problem does not occur with the majority of battery-operated equipment. Most of these devices use a separate charger or transformer that is plugged into an AC receptacle. The Power-On-Board™ 400 is easily capable of running most chargers and transformers.

3.4 FUSE REPLACEMENT

If the inverter is overloaded and the spade type fuses are blown, flip up the fuse replacement covers on the back of the Power-On-Board™ 400 and replace the blown fuses with new spade type, 25 Amp fuses. Determine the cause of the short before restarting the inverter.

3.5 PLACEMENT OF THE INVERTER

For best operating results, the inverter should be placed on a flat surface, such as the ground, car floor or seat, or other solid surface. A power cord measuring 3 feet (1.0 meter) has been provided for easy positioning of the inverter. The inverter should only be used in locations that meet the following criteria:

DRY - Do not allow water and/or other liquids to come into contact with the Power-On-Board™ 400 inverter.

COOL - Ambient air temperature should be between 30°F (-1°C) non-condensing, and 105°F (40°C). Do not place the inverter on or near a heating vent or any piece of equipment which is generating heat above room temperature. Keep the inverter away from direct sunlight, if at all possible.

VENTILATED - Keep the area surrounding the inverter clear to ensure free air circulation around the unit. Do not place items on or over the inverter during operation. A fan is helpful if the inverter is operating at maximum power outputs for extended periods of time. The unit will shut down if the internal temperature exceeds 90°C. The unit will restart after it cools.

SAFE - Do not use the inverter near flammable materials or in any locations that may accumulate flammable fumes or gases.

4. OPERATING TIPS

4.1 RATED VERSUS ACTUAL CURRENT DRAW OF EQUIPMENT

Most electrical tools, appliances and audio/video equipment have labels that indicate the power consumption in amps or watts. Be sure that the power consumption of the item you wish to operate is rated at 400 watts or less. (If the power consumption is rated in amps AC, simply multiply by the AC volts (110) to determine the wattage). The inverter has overload protection, so it is safe to try to operate equipment rated at 400 watts or less. The inverter will shut down if it is overloaded, and will restart once the overload is removed.

Resistive loads are the easiest for the Power-On-Board™ 400 to run. However, larger resistive loads, such as electric stoves or heaters, usually require more wattage than the Power-On-Board(tm) 400 can deliver on a continuous basis. Inductive loads, such as TV's and stereos, require more current to operate than do resistive loads of the same

wattage rating. Induction motors, as well as some televisions, may require 2 to 6 times their wattage rating to start up. The most demanding in this category are those that start under load, such as compressors and pumps. Testing is the only definitive way to determine whether a specific load can be started and how long it can run. The unit will simply shut down if it is overloaded. To restart the unit after a shutdown due to overloading, momentarily turn off the power to the unit.

CAUTION: This inverter will not operate high wattage appliances or equipment that produce heat, such as hair dryers, microwave ovens, and toasters.

4.2 BATTERY OPERATING TIME

With a typical vehicle battery, a minimum operating time of 2 to 3 hours can be expected. In most instances, 5 to 10 hours of operating time is achievable. However, Vector recommends that the operator start the vehicle every 2 to 3 hours to recharge the battery system. This will guard against any unexpected shut-down of the equipment and will ensure that there is always sufficient battery capacity to start the vehicle's engine. The inverter will sound it's alarm when DC voltage drops to 10.6V.

The inverter may be used whether or not the vehicle's engine is running. However, the inverter may not operate while the engine is starting since the battery voltage can drop substantially during cranking.

The inverter draws less than 0.3 ampere from the battery when it is not supplying power to a load. In most instances, the inverter can be left connected to the battery when not in use since it draws so little current. However, if the vehicle is to remain unused for several days, disconnect the inverter from the battery.

5. PROTECTIVE FEATURES OF THE INVERTER

Your Power-On-Board™ 400 monitors the following potentially hazardous conditions:

Low Battery Voltage - This condition is not harmful to the inverter but could damage the power source. An audible alarm will sound when input voltage drops to 10.6. The Power-On-Board™ 400 automatically shuts down when input voltage drops to 10.0 volts. When the condition is corrected, the unit may be restarted.

Over Voltage Protection - The Power-On-Board™ 400 will automatically shut down when the input voltage exceeds 15 volts DC.

Short Circuit Protection - Reverse polarity or a short circuit condition will usually result in the fuse being blown. Immediately disconnect the shorted load and replace the fuse as described in section 3.4.

Overload Protection - The inverter will automatically shut down when the continuous draw exceeds 400 watts.

Over Temperature Protection - When the temperature sensor inside the Power-On-Board™ 400 reaches 150°F, the unit will automatically shut down. Allow the unit to cool for at least 15 minutes before restarting after a heat-related shutdown. Unplug unit while cooling.

Low Battery Alarm - An alarm will sound when the voltage from the battery drops to 10.6 volts. This is an indication that the battery needs to be recharged. The user should stop operation of the electronic device at this time since the inverter will shut down automatically shortly there after, when the battery voltage drops to 10 volts. Start your engine to recharge the battery.

If the low voltage alarm sounds when the battery is fully charged, follow the steps for solving lack of output power in the Troubleshooting Guide. The alarm will sound when the inverter is overloaded, in thermal shutdown, or if there is an excessive voltage drop between the battery and inverter.

NOTE: It is normal for the alarm to sound while the unit is being connected to, or disconnected from, the power source. This is not indicative of a problem.

6. COMMON PROBLEMS

"Buzzing" sound in audio systems:

Some inexpensive stereo systems and "boom boxes" emit a buzzing sound from their speakers when operated from the Power-On-Board™ 400 power inverter. This occurs because the power supply in the electronic device does not adequately filter the modified sine wave produced by the inverter. The only solution to this problem is to use a higher quality sound system that incorporates a higher quality power amplified supply.

Television Interference:

The Vector Power-On-Board™ 400 is shielded to minimize interference with TV signals. However, in some instances, some interference may still be visible, particularly with weak TV signals. Try the following corrective measures:

- Position the inverter as far as possible from the television, the antenna and the antenna cables. Use an extension cable, if necessary
- Adjust the orientation of the inverter, the antenna cables and the TV power cord to minimize interference
- Make sure that the antenna feeding the television provides an adequate ("snow free") signal and that high quality, shielded antenna cable is used

7. TROUBLESHOOTING GUIDE:

TABLE 1 - INVERTER POWER SWITCH TURNED ON

TROUBLE / INDICATION	POSSIBLE CAUSE	SUGGESTED REMEDY
No AC output – red LED lit	DC input below 10 Volts	Recharge or replace battery
No AC output – red LED lit	Excessive appliance load-thermal shutdown	Reduce load-wait for inverter to cool. Turn Off, then turn On
No AC output	Inverter cold	Disconnect load from inverter. Operate inverter without load for a few minutes. Reconnect load.
No AC output – Green LED not lit	Inverter fuses open	Open fuse caps in back of inverter. Remove fuses and replace with same type and rating
Low battery alarm sounds continuously	Bad connection or wiring	Tighten all DC connections
Low battery alarm sounds	Low battery voltage	Recharge battery. Remove load from inverter while recharging battery
Motorized power tool won't start	Excessive start-up load	Rock the On / Off switch several times. If appliance does not start, then appliance will not work with inverter

TABLE 1 - INVERTER POWER SWITCH TURNED ON CON'T

TROUBLE / INDICATION	POSSIBLE CAUSE	SUGGESTED REMEDY
Motorized power tool does not operate at correct speed	Purely inductive load	Make the load not purely inductive. Operate an incandescent lamp at same time as motor
Television / Radio interference	Snow in picture, buzz in speaker	Keep inverter and antenna distant from each other. Use shielded antenna cable. Connect antenna to amplifier

8. SPECIFICATIONS

Maximum Continuous Power ..... 400 watts
Surge Capacity (Peak Power) ..... 800 watts
Maximum Efficiency Approx. 90%
No Load Current Draw 0.3A
Low Voltage Shutdown Activation ..... 10.0 volts DC
Low Voltage Alarm Activation ..... 10.6 volts DC
Wave Form ..... Modified Sine Wave
No. of AC Receptacles ..... Two
Fuses ..... Two 25 Amp (spade-type)
Weight ..... 2.42 lbs. (l.1 kg)
Length ..... 6-3/8 in. (16.2 cm)
Width ..... 6-1/8 in. (15.6 cm)
Height ..... 2-1/8 iri. (5.4 cm)

120 DAY / 2 YEAR LIMITED WARRANTY PROGRAM

This limited warranty program is the only one that applies to this product, and it sets forth all the responsibilities of Vector Manufacturing, Ltd., regarding this product. There are no other warranties, other than those described herein.

This Vector Manufacturing, Ltd. product is warranted, to the original purchaser only, to be free of defects in materials and workmanship for 120 days from the date of purchase without additional charge. This warranty may be extended to two years from date of purchase by paying an Extended Warranty fee (see below). The warranty does not extend to subsequent purchasers or users. Vector Manufacturing, Ltd. will not be responsible for any amount of damage in excess of the retail purchase price of the product under any circumstances. Incidental and consequential damages are specifically excluded from coverage under this warranty.

This product is not intended for commercial use. This warranty does not apply to accessories or damage to units from misuse or incorrect installation. Misuse includes wiring or connecting to improper polarity power sources.

RETURN / REPAIR POLICY: Defective products, other than accessories, may be returned postage prepaid to Vector Manufacturing. Any defective product, other than accessories, that is returned to Vector Manufacturing within 30 days of the date of purchase will be replaced free of charge. If such a product is returned more than 30 days but less than two years from the purchase date, Vector Manufacturing will repair the unit or, at its option, replace it free of charge. If The Extended Warranty was activated, this repair or replacement period extends to four years from the purchase date.

If the unit is repaired, new or reconditioned replacement parts may be used, at Vector Manufacturing's option. A unit may be replaced with a new or reconditioned unit of the same or comparable design. The repaired or replaced unit will then be warranted under the terms of the remainder of the warranty period.

The customer is responsible for the shipping charges on all returned items. During the warranty period, Vector Manufacturing, Ltd. will be responsible for the return shipping charges.

LIMITATIONS: This warranty does not cover accessories, bulbs, fuses and batteries, defects resulting from normal wear and tear (including chips, scratches, abrasions, discoloration or fading due to usage or exposure to sunlight), accidents, damage during shipping to our service facility, alterations, unauthorized use or repair, neglect, misuse, abuse, failure to follow instructions for care and maintenance, fire, flood, and Acts of God.

If your problem is not covered by this warranty, call our Technical Support Department at (954) 584-4446 for general repair information and charges if applicable.

STATE LAW RIGHTS: This warranty gives you specific legal rights. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the exclusions or limitations stated herein may not apply. This warranty gives the purchaser specific legal rights; other rights, which vary from state to state, may apply.

TO REQUEST WARRANTY SERVICE FOR THIS PRODUCT: Contact Vector Manufacturing Technical Support by telephone, fax or mail. We suggest that you keep the original packaging in case you need to ship the unit. When returning a product, include your name, address, phone number, dated sales receipt (or copy), and a description of the reason for return and product serial number. After replacing the unit, we will return it to you within four weeks.

WARRANTY ACTIVATION: Please complete Warranty Activation Card and mail to Vector Manufacturing. If activating Additional Extended Two Year Warranty, (total two years) enclose check or money order for $20.00 Enter "VEC031POB" as Model and Power Inverter as "Product Type". All Vector Manufacturing, Ltd. products must be registered within (30) days of purchase. To activate this warranty, mail completed registration form, a copy of the original sales receipt and required fee (if activating extended warranty) to:

WARRANTY REGISTRATION
VECTOR MANUFACTURING, Ltd.
4140 S.W. 28th Way; Fort Lauderdale, Florida 33312

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FT. LAUDERDALE, FL 33312 MADE IN CHINA